



TS-28 Immersion White Tin Solution

GENERAL DESCRIPTION

TS28 is specially engineered “Immersion White Tin” processes that can be used as a direct replacement for the hot air solder leveling process. It will cover active copper surfaces with a very dense white tin that retains its solderability in excess of one year. The key to the process is the type and structure of the deposit. It is a fine crystalline structure that is non-porous.

The TS28 process consists of two proprietary products. The first is TS14, a pre dip solution that activates the copper surface. This ensures that the subsequent step, TS28, will chemically deposit the correct structure of white tin.

CONTROL PROCEDURES

TS28 should be analyzed regularly and small additions should be made frequently. This will keep the TS28 bath operating at optimal conditions.

TS28 dissolves copper as tin is plated. As the copper concentration increases, a white precipitate will form in TS28. The white precipitate is a copper-thiourea complex. The copper-thiourea complex will dissolve in heated TS28, but will precipitate out as the TS28 is cooled to room temperature. It is best to filter out the white copper precipitate when the TS28 baths are at room temperature. This should be done on a weekly basis.

Iron concentration can cause a dark tin deposit and possibly solderability issues. It is very important that metal parts do not come into contact with the TS28 bath. All metal parts used must be coated in an appropriate type of plastic. See “Operating Parameters” above.

TANK CLEANING PROCEDURES

- 1) Drain all old immersion tin from tank(s).
- 2) Rinse with water.
- 3) Remove all filter cartridges.
- 4) Fill tank with water and add 5% NaOH.

Operating Parameters

PARAMETERS	VALUES
Make-Up	100% TS28 by volume
Temperature	140 to 160°F (60 to 71°C)
Immersion Time	10 to 15 minutes
Process	Batch Tank or horizontal flood bar
Agitation	Will speed through hole coverage
Circulation	Continuous
Filtration	Batch filter cold through a 1-3 micron filter
Ventilation	Advised
Tanks	Polypropylene, Polyethylene. Do not use PVC.
Racks, Baskets	Plastic-coated stainless steel; use polypro or Halar (black or green). Do not use PVC.
Heaters	Quartz, Enamel, Teflon, PTFE with power < 2 W per sq. cm.

Physical Properties

PROPERTIES	
Specific Gravity	1.26- 1.28
pH	<2.0
Appearance	Viscous yellow liquid
Odor	Sickly sweet odor





- 5) Heat to 130-140°F and circulate for 4+ hours.
- 6) Make sure all the residues of tin are removed then rinse with water.
- 7) Rinse with water and circulate.
- 8) Tank may be a brown color. If so, make up a 5% sodium persulfate solution and circulate.
- 9) Rinse with water.
- 10) Mechanical clean around tank.
- 11) Fill tank with water add 2-3% TS14 and circulate for 1 hour.
- 12) Empty tank. It is now ready for TS28 chemistry.

ANALYSIS PROCEDURES

Specific Gravity:

TS28 baths should be analyzed for specific gravity at least daily, and maintained between 1.24 and 1.30 (measured at room temp ~ 25C). Determine specific gravity by hydrometer or accurately weighing a known volume of TS28 bath at room temperature (25C). If done by weight, the specific gravity is the ratio of weight in grams divided by volume in millimeters.

Operation of the Room Temperature TS28 Strike Bath:

During the use of the room temperature TS28 strike bath, TS14 pre-dip will drag into the bath and TS28 solution will be dragged out. This will lower the bath volume and increase the specific gravity. Specific gravity should be maintained daily, through the addition of deionized water. Small frequent additions are recommended.

Operation of the Heated TS28 Bath:

During the use of the heated TS28 bath, water will evaporate from the bath and solution will be dragged out. This will lower the bath volume and increase the specific gravity. Specific gravity should be maintained daily, through the addition of deionized water. Small frequent additions are recommended.

Acid Normality

Reagents and Equipment:

1.0 N Sodium Hydroxide
Cresol Red indicator solution (0.1g in 100 ml alcohol) or a pH meter
250 ml Erlenmeyer flask
2.0 ml pipet
50 ml buret

Procedure – Using Cresol Red:

1. Pipet 2.0 ml of TS28 working solution into the 250 ml Erlenmeyer flask.



2. Ass ~75 ml of deionized water and 2 to 3 drops of Cresol Red indicator solution.
3. Titrate with 1.0 N sodium hydroxide from yellow to purple endpoint.
4. Calculation:

$$\text{Acid Normality} = (\text{mls of base}) \times (\text{Normality of base}) \times 0.5$$

An active TS28 should have an acid normality between 5.0 and 8.0. Maintain acid normality through specific gravity adjustments. Evaporation of water out of the TS 28 bath will increase acid normality. Additions of DI water will decrease the acid normality.

If Cresol Red indicator is not available; analysis can be made using a pH meter. See analysis below.

Procedure – Using a pH Meter:

1. Pipet 2.0 ml of TS28 working solution into a 300 ml beaker.
2. Add ~75 ml of deionized water and mix.
3. Calibrate the pH meter using pH=4.00 and pH=7.00 buffers.
4. Titrate with 1.0 N sodium hydroxide to a pH of 7.4 to 8.6. (The pH will change rapidly in this region).
5. Calculation:

$$\text{Acid Normality} = (\text{mls of base}) \times (\text{Normality of base}) \times 0.5.$$

Determination of Stannous Tin Content

Reagents and Equipment:

25 ml buret

5.0 ml pipet

250 ml Erlenmeyer flasks

50 ml graduated cylinder

0.05 M EDTA Solution

Acetate Buffer Solution

(270 grams of sodium acetate trihydrate & 60 mls glacial acetic acid diluted to 1.0 liter in DI water)

OR (162 grams of anhydrous sodium acetate & 60 mls of acetic acid diluted to 1.0 liter in DI water)

Methylthymol Blue indicator crystal blend

(1 gram of methylthymol blue, tetrasodium salt mixed with 99 grams of potassium chloride crystals)

[Fisher Scientific part # AC10637-0050 or VWR Scientific part # JTR164-1]

The indicator crystal blend is stable indefinitely.

Procedure:

1. Add 25 mls of Acetate Buffer solution and ~75 mls of deionized water into a 250ml Erlenmeyer flask.
2. Pipet 5.0 mls of working solution into the flask. (Be careful to pipet only the liquid, solids will cause errors in the titration.)
3. Mix and add Methylthymol Blue crystal blend until a red-orange color is present.
4. Titrate the solution with 0.05 M EDTA solution from red-orange to a yellow endpoint.
5. Calculation:

$$\text{Stannous Tin (g.l)} = (\text{mls of EDTA solution}) \times (\text{Molarity of EDTA Solution}) \times 24$$

Maintain the level of stannous tin above 18 grams per liter. To increase the stannous tin concentration by 1 g/l, add 15 mls of TS56 Tin Replenisher per liter bath.

Determination of Copper content

Copper concentration is best determined by Atomic Absorption. Use one of the following dilution ratios for best results: 0.1 mL TS28 into 100 mL of 10% methane sulfonic acid, or 1.0 mL TS28 into 100 mL of 10% methane sulfonic acid.

Copper is removed from TS28 by cooling the TS28 bath to room temp. and then filtering out the white copper-thiourea precipitate. It is best to use a larger filter rating initially and work down to a small filter rating to remove all of the copper precipitate. For example, start with a 20 micron filter, then a 10 micron filter and finish with a 1 micron filter. Discard the filters when they are plugged with copper precipitate.

We recommend maintain the copper concentration below 8.0 grams per liter.

SAFETY AND STORAGE

TS28 is a corrosive, acidic solution containing organic acids. Avoid breathing vapors. Use in a well-ventilated area. When handling concentrate or working solution, wear protective clothing, gloves and chemical safety goggles. In case of skin contact, remove contaminated clothing and flush affected area with plenty of cold water. In case of eye contact, flush immediately with plenty of cold water and seek medical attention immediately.

Store TS28 in its original container. Keep away from direct sunlight and temperature extremes. Protect from freezing.

WASTE TREATMENT

TS28 contains organic and tin metal salts. In the process of activating copper clad material, some copper may be removed and dissolved in solution. The spent working solution of TS 28 may be treated by pH adjusting the solution to a pH above 10 with dilute caustic soda. Allow the precipitate to settle. Filter the solution and make a final pH adjustment of the solution to between 6 and 8 with dilute sulfuric acid before sending the spent solution to the sewer. Consult with local officials for further waste disposal regulations.

MISCELLANEOUS

- Packaging comes in 1 gallon, 5 gallon, and 55 gallon containers. Consult MSDS sheet for additional information.
- The information given in this technical data sheet is to the best of our knowledge accurate. It is intended to be helpful but no warranty is expressed or implied regarding the accuracy of such data. It is the users responsibility to determine the suitability of his own use of the product described herein; and since conditions of the use are beyond our control, we disclaim all liability with respect to the use of any material supplied by us. Nothing contained herein shall be construed as permission or as recommendations to



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Product Data Sheet

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